BAC DataMaster
Supervisor Guide

Please read
"Unpacking and Set up procedures" on page 3 before proceeding

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Supervisor Guide Index

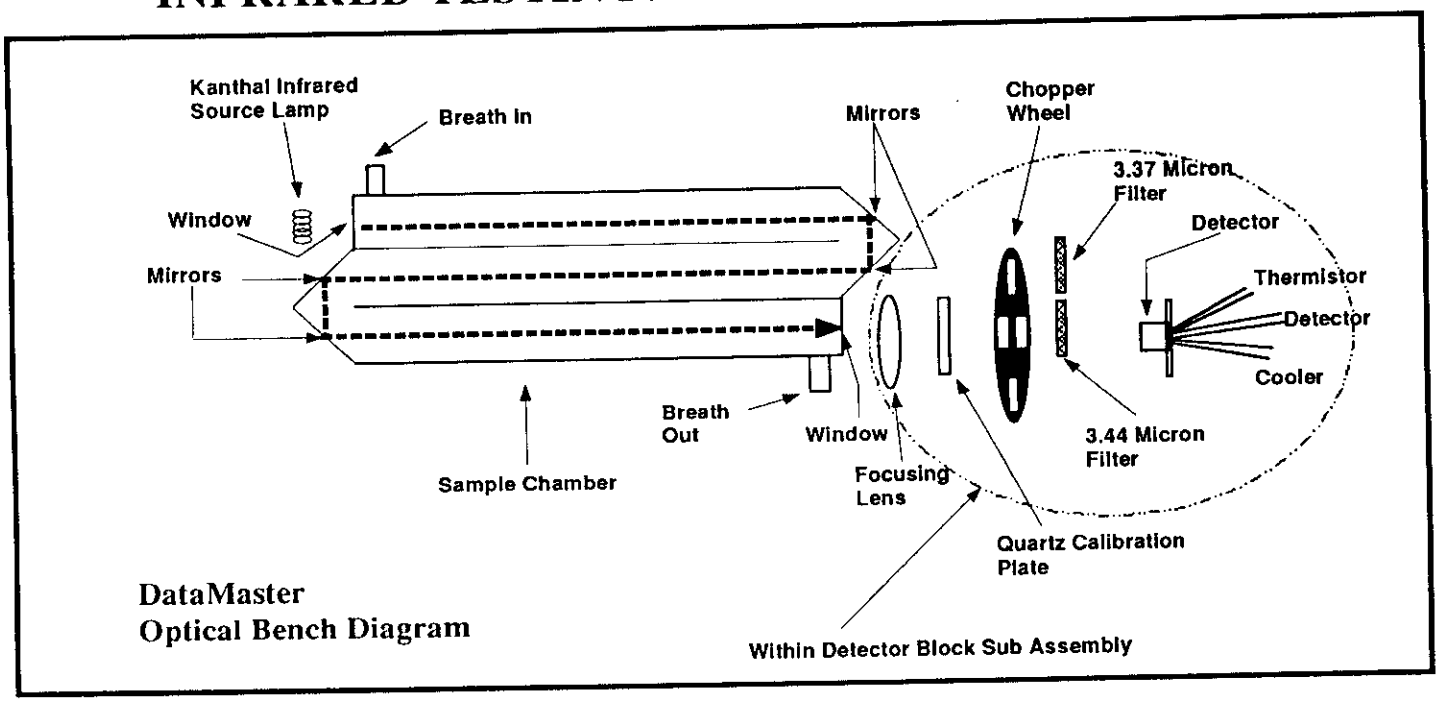
Welcome to the BAC DataMaster Infrared Electronic Breath Alcohol Measuring Instrument. This supervisor guide is designed to cover the advanced features of the BAC DataMaster with which the program supervisor should be familiar. As such, basic testing routines and data entry will not be discussed here. For an explanation of the basic operator functions, the "Basic Operator Guide" should be consulted. It is presumed that each supervisor is familiar with the document.

The information contained in this guide is generic for the standard DataMaster and the DataMaster with the "K" Option (with integral keyboard). The software, internal hardware, test sequences and data entries may or may not be the same as that used by any particular law enforcement or other independent agency. For this information it is necessary to contact that particular agency as most law enforcement agencies print customized guides based on the software and hardware configurations chosen.

The BAC DataMaster operates on the scientifically accepted principal of absorption of infrared energy. The technology has been in use in the art of breath alcohol testing for over 20 years and is judicially accepted in every state in the union. The DataMaster has been in production since 1987 and is in use in, or approved by over 30 states.

The BAC DataMaster is approved by the National Highway Traffic Safety Administration and is listed on the Conforming Product List.

INFRARED TESTING: A LAYMAN'S EXPLANATION



Testing for the presence and quantity of a chemical such as alcohol using the principle of Infrared absorption has been in use by the law enforcement field for breath alcohol testing since the early Seventies. In layman's terms, here is what happens: The molecular bonds of chemical compounds such as alcohol have the characteristic of being "excited" at certain wavelengths of infrared energy (IR for short). By "excited," it is meant that the molecular bonds holding the atoms of hydrogen, carbon and oxygen together actually start to vibrate when the IR energy is focused on them. When they do vibrate, they use up some of the energy, much like light uses a battery to burn.

Put simply then, if we know how much IR energy was present before the alcohol was in the cell to do the absorbing, and we know how much is present while the alcohol is there, we can tell how much alcohol is in our cell by measuring how much IR energy is gone or used. By allowing only the wavelengths of IR energy that are sensitive to alcohol to pass thru our sample, we can also preclude the possibility of something other than alcohol adding to our measurement, although in real life, a concept called "dual wavelength filtration" is used to act as a double check on those compounds that possibly might be found in the breath sample that are chemically close to alcohol.

Now that you know basically what happens, we can talk a little about what makes some instrument characteristics better than others. What we are talking about here are some basic and universally accepted scientific principles.

It is universally accepted in infrared testing that the longer the distance the energy must travel through the chemical, the better opportunity it will have to be absorbed and therefore a more precise differential in before and after measurement may be obtained. This is referred to as "Resolution" and is a direct function of the length of the sample cell. The longer the cell, the better the Resolution.

It is also universally accepted that the purer the sample of the chemical we are testing for, the better the accuracy. In breath testing, this means that it is more desirable to have a small sample of alveolar air, than a larger sample of air which would, of necessity, include more air that was not alveolar. The smaller the volume, the better the accuracy.

The scientific community also holds that, for greater sensitivity, there should be as great a temperature differential as possible between the reflected I.R. energy and that of the detecting element. This makes the detector more responsive and gives a better "signal." There are cooled detectors and there are detectors that work at ambient temperatures. The cooler the detector, the better the precision.

This combination of a longer path length, a cooled detector and a small sample cell volume, will make an instrument very accurate at low levels of alcohol (.001 to .010). It can also measure very low levels of interfering compounds (.001 to .010). It is also more repeatable at all levels, meaning it can give virtually the same readings consistently on the same samples, test after test.

BAC DataMaster Sampling System

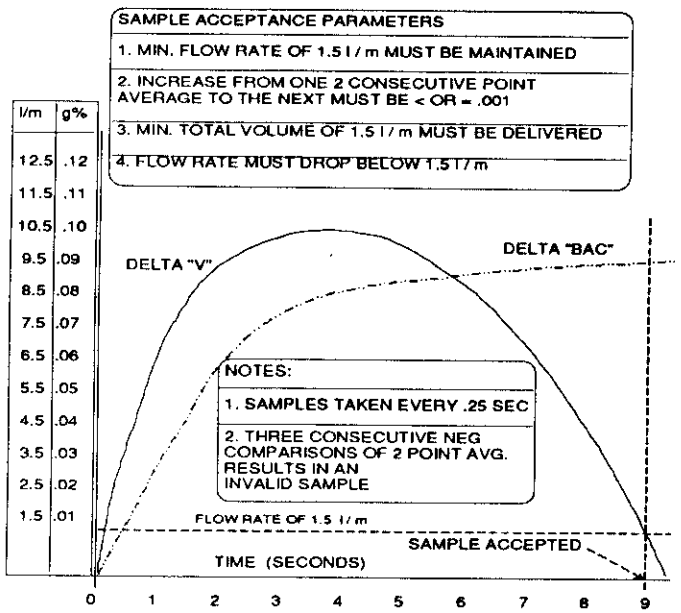
The sampling system in use in the DataMaster incorporates three criteria to establish a complete test. These criteria are (1) a minimum flow rate of 1.5 liters per minute coupled to a minimum volume of 1.5 liters of air, (2) a slowing of the rise in the reading of the IR detector that is indicative of aveolar air, and (3) a slowing of the flow or easing of the breath pressure.

First, we will look at the minimum air volume. It is critical that this be a continuous breath flow of sufficient rate (approx. 1.5 liters per minute) to change the flashing "Please Blow" indication on the display to a solid (non flashing) "Please Blow" and an audible "beep" to a solid tone. This flow is measured by a thermistor placed in the breath path and when a minimum volume of 1.5 liters of air has passed into the system the minimum volume requirement is met.

As the drinking subject blows, the percentage of alcohol in the breath moving into the cell is increasing. The first portions of the breath sample are from the mouth which have relatively little alcohol compared to the alveolar air. Therefore, what the instrument "sees" electronically and what you see on the display are rising numbers as the air in the sample cell is replaced first by mouth air and then by alveolar. When the subject reaches the deep lung air which is characterized by a relatively uniform concentration of alcohol, the rate at which the reading is rising slows, and although some rise can still be noted the subject is beginning to run out of breath.

The DataMaster microprocessor is "watching" how fast the reading is rising and is "waiting" for the fast upward movement of the display to slow down. If the subject stops blowing before the uniformity of concentration (aveolafr air) is noted by the instrument, the test cycle will not be completed. If the subject starts blowing again and introduces a sufficient amount of breath into the instrument, the test can usually be completed without further difficulty. However, if the 2 minute window of opportunity is exceeded, the instrument will either ask if the subject is refusing the test, or may print "Incomplete Sample", depending on software. Assuming that the sample is sufficient, the third criteria, a reduction of the flow can then be established at which time the test will be completed.

IT IS IMPORTANT TO UNDERSTAND THAT ALL THREE CRITERIA WORK TOGETHER AND THAT FAILURE TO MEET ANY ONE OF THE THREE WILL INHIBIT SAMPLE ACCEPTANCE.



A lack of understanding of the system can lead to difficulty in obtaining a sample from an alcohol free subject, particularly during training. Usually, this difficulty is because the subject fails to relax breath pressure after having completed the minimum blowing time. Maintaining a constant pressure will inhibit completion. The perception is that the instrument is asking for too much air when really if the alcohol free subject had simply eased blowing at an earlier point in the test, the instrument would have accepted the sample.

In all instruments, the best procedure for the testing officer to use is simply to tell the subject to take a normal or moderate breath and to blow until he is told to stop. The officer, of course, does not say when to stop, the subject will run out of breath and the instrument will cycle complete at the same time. This is exactly how it should happen. Instructing the subject to take a deep breath is not helpful, and may be detrimental as it simply means there is more air to be expelled before the alveolar air is reached. Never instruct a subject to blow hard as this can cause small vapor droplets to be forced through the mouthpiece and into the sample cell, causing the instrument reading to be slightly unstable which, in turn, will prolong acceptance. Remember, it is *CONCENTRATION UNIFORMITY*, not volume, that is necessary for a good test.

Unpacking and Setting up your New BAC DataMaster

Please read the following completely before setting up your new DataMaster.

1. Select a room or location for your new instrument keeping the following in mind.

A. The room or area should be reasonably clean.
B. The room should not be accessible by inmates or unautho rized persons on an unsupervised basis.
C. The room should have adequate ventilation to facilitate cool ing of the instrument.
D. The room should not be so warm or cool as to be uncomfort able for use. We suggest a temperature range of 65°F to 78°F.

2. Select a table, desk or stand for your instrument.

A. Optimally the desk or table should be at least 20" deep by 30" long and at a comfortable working height. This will allow for access to the instrument, space for a simulator, and cover removal if necessary
B. The table or stand surface must be flat and firm and there must be an unobstructed clearance to the underside of the DataMaster for proper cooling. You may wish to mark the position of the rubber feet of your instrument after you have positioned it where it will stay and then screw 4 bottle caps to the table surface at these positions. Place the feet of the DataMaster into these caps. This will keep the instrument from easily being shoved out of position.
C. Arrange to have the subject retention area to the right of the instrument as the operator would face it, if possible.
D. Arrange for an accessible area for storage of tickets and mouthpieces.
E. If the DataMaster is to be kept in an enclosed cabinet adequate ventilation must be provided or the instrument must be turned off when not in use.

3. Consider the power requirements for the instrument.

A. A dedicated outlet is preferable, but not essential *providing there are no large appliances also on the same line.* Be sure no refrigerators, coffee makers, drinking fountains, air conditioners or the like are on the same line as your BAC DataMaster.
B. Surge protection is suggested although not mandatory. While the BAC DataMaster is protected internally against surges and brown outs, additional dedicated protection is helpful.
C. For the benefit of your new DataMaster and all your other computers and computer driven instruments, have your electrician check your emergency generator system. When it turns on, the system should not be immediately "on line." The low voltage condition that is present as a generator comes up to power can be damaging to your equipment. Your generator should turn on, come up to speed and then switch into your main system. The difference is only a few seconds, but can save your equipment from damage by low voltage conditions.

4. Making your DataMaster operational.

A. Unpack your new DataMaster and place the instrument on the table you have selected. Inspect the instrument for any possible shipping damage.
B. Remove the RF Antenna, Breath Tube and Power Cord from the accessory bag. **(Refer to Figure 2 "Rear Panel" for the following)**
1. Install the RF Antenna by screwing it into the antenna mounting bracket on the rear panel. Hand tighten only.
2. Install the breath tube by pushing the elbow fitting at the lower end of the breath tube into the receptacle marked "Breath Tube" on the rear panel.
3. Connect the breath tube heater plug at the base of the breath tube into the receptacle immediately below the receptacle marked "Breath Tube" on the rear panel.
4. Connect the AC power cord into the instrument and the other end into the selected surge protection device or into the nearest wall outlet.
5. **If your DataMaster is an Option "K" model, go directly to item 6 below.** Locate the keyboard cable and plug one end into the port marked "Keyboard" on the rear panel of the DataMaster and the other end into the rear of the keyboard.
6. Position the instrument and keyboard on the table as desired.
C. Save the shipping carton and interior packing supplies.
D. Turn the instrument on at the Switch on the rear panel. The display should read "Please Wait" while the instrument warms up.

5. Should you leave your DataMaster on or turn it off between tests?

Whether you leave your instrument on or turn it off between tests should depend on the frequency of tests. It will take about 10 minutes for the instrument to warm up, so by the time you complete your subject observation time, the DataMaster will be ready to run a test. It is also true that if the Instrument is off, it cannot be damaged by electrical strikes, power outages and janitors that want to play with equipment. An instrument that is off also consumes no power.

One good approach is to turn it on and off as needed during the week and leave it on over Friday and Saturday or those evenings that are typically the high usage times.

Generally speaking, Instruments that are turned off between tests stay cleaner and require less maintenance than those that are left on continuously.

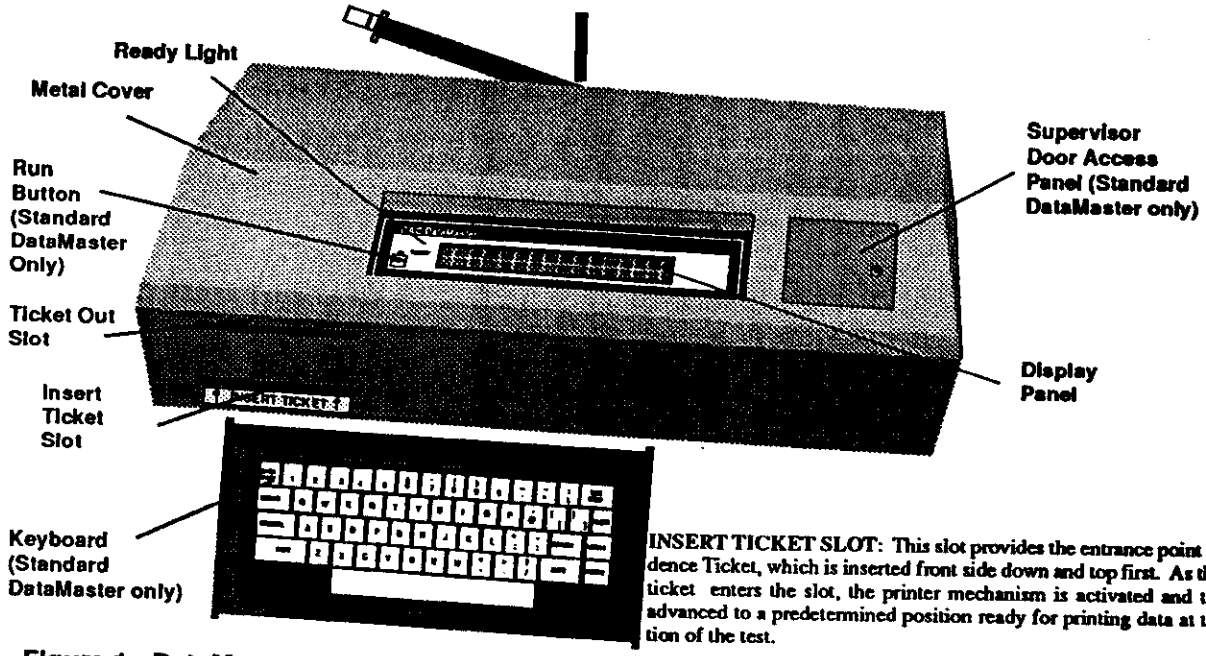


Figure 1: DataMaster Front and Cover

Front and Cover

DISPLAY PANEL: The display panel provides instructions and messages for operation of the DataMaster.

READY LIGHT: When illuminated, the green ready lamp indicates the instrument is ready to begin a test.

KEYBOARD: The keyboard allows the operator to provide input data for subject and simulator testing. The keyboard on the option "K" model is an integral part of the cover.

BREATH TUBE: The breath tube is used to provide test samples to the instrument. It is heated to prevent condensation and must be used with a sanitary mouthpiece.

INSERT TICKET SLOT: This slot provides the entrance point for the Evidence Ticket, which is inserted front side down and top first. As the evidence ticket enters the slot, the printer mechanism is activated and the ticket is advanced to a predetermined position ready for printing data at the completion of the test.

TICKET OUT SLOT: This unlabeled slot above the Insert Ticket Slot is the exit port for the Evidence Ticket at the completion of printing.

METAL COVER: The cover is 18 gauge steel and may be cleaned using a mild window cleaner such as "Windex". The cover is attached by 4 1/4 turn screws on the back panel along with 2 grounding screws. The cover should not be removed unless under a technician's direction.

RUN BUTTON: This button is located on the display on the Standard DataMaster, and on the upper left of the keyboard on the Option "K" model. This button will initiate the subject test sequence. It may be protected by a password.

SUPERVISOR PANEL DOOR: This locked panel houses the "Special Operations" buttons used by supervisory personnel. These "Special Operations" buttons are located along the top row of the keyboard on the Option "K" Model.

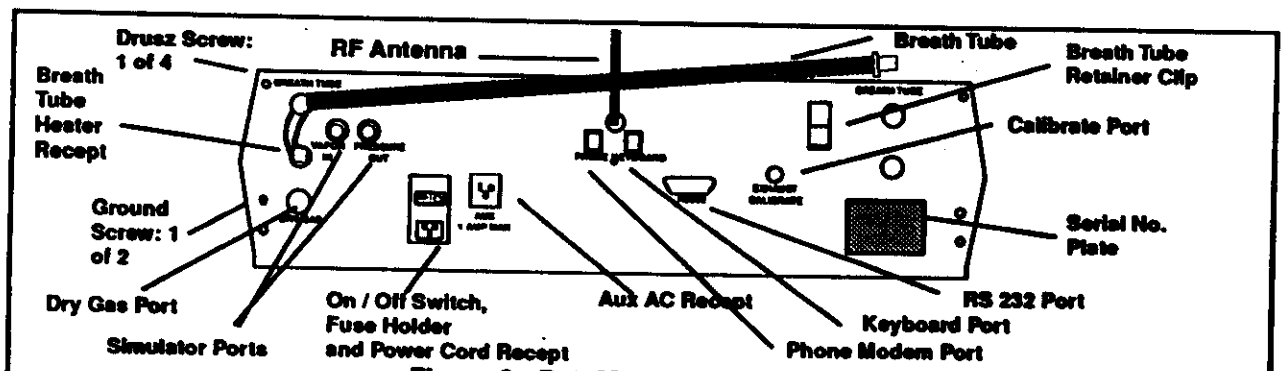


Figure 2: DataMaster Rear Panel

Rear Panel

BREATH TUBE: Two Breath Tube ports are identified on the rear panel, one in each upper corner, although only one position will be installed. This breath tube is not to be removed except for possible cleaning.

HEATER PLUG: This plug provides a source of power for the Breath Tube heater.

RADIO FREQUENCY DETECTION (RF) ANTENNA: The antenna will detect the presence of RF in the vicinity of the instrument. If the level is excessive, the Instrument will abort a test in progress. CAUTION: PORTABLE RADIO TRANSMITTERS, IF USED DURING TESTING WILL CAUSE THE INSTRUMENT TO ABORT ANY TEST IN PROGRESS. DO NOT USE RADIOS FOR TRANSMITTING DURING A TEST.

ON/OFF SWITCH: This switch controls power to the DataMaster. The instrument may be turned off during periods of prolonged inactivity. A battery backup system will maintain correct time and date.

IN THE EVENT OF SEVERE THUNDERSTORM ACTIVITY AND GENERATOR TESTING, THE INSTRUMENT MUST BE TURNED OFF AND PREFERABLY UNPLUGGED. THE INSTRUMENT SHOULD NOT BE PLUGGED INTO THE SAME ELECTRICAL OUTLETS AS HEAVY USE APPLIANCES SUCH AS REFRIGERATORS, AIR CONDITIONERS, COFFEE MAKERS AND DRINKING FOUNTAINS.

POWER CORD RECEPTACLE: Use only the grounded power cord furnished with the instrument. This receptacle also houses the fuse for incoming power. Remove the power cord before attempting to access the fuse portion of the assembly.

AUXILIARY AC RECEPTACLE: This grounded outlet may be used to power the simulator only. Do not use for any other purposes. 120 volt AC, 1 amp max. (May not be active.)

PHONE MODEM RECEPTACLE This receptacle is used to connect to a phone line when data transmission is being utilized.

KEYBOARD CABLE RECEPTACLE : This receptacle is used to connect the keyboard cable to the DataMaster on those models using an external keyboard.

CALIBRATE PORT: This port is used to vent the sample cell during purge and subject testing and is also used to provide recirculation during the process of instrument factory calibration. It is never used while conducting a simulator test.

SIMULATOR PORTS: "VAPOR IN" AND "PRESSURE OUT": These ports are used when conducting a recirculating simulator test. The simulator may remain connected to these ports as long as desired. These ports are not installed in all style DataMasters.

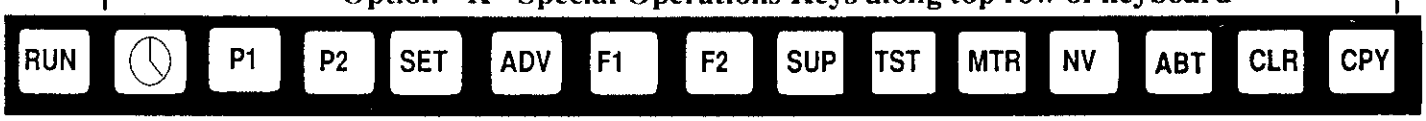
DRY GAS PORT (optional): This port is optionally used to test the DataMaster using a Dry Gas Standard.

BREATH TUBE CLIP: This clip is used to cradle the heated "Breath Tube" when not in use.

SERIAL NUMBER PLATE: The serial number of the instrument is found on this plate.

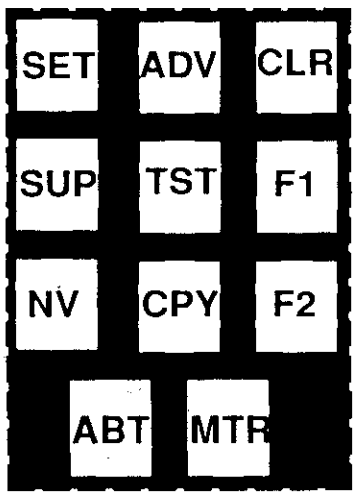
DESIGN OF SPECIALIZED OPERATION KEYS

Option "K" Special Operations Keys along top row of keyboard



KEYS (FUNCTION ROUTINES)

These specialized operations keys, found along the top of the keyboard on the Option "K" model and in the locked supervisor panel on the Standard DataMaster provide access to the operational sequences of the instrument. Some or all may be password protected and some may have different passwords than others, depending on your software. Below is an explanation of each of these keys.



Standard DataMaster Special Operatiuons Keys.

The "RUN" Key is used to initiate a subject test. See the Basic Operator Guide for an explanation of the Subject Test. See "Cover Description" for location of this key on your instrument.

The "Clock" (time dial) is used in some software to print a separate time line on the evidence ticket marking the beginning of the subject observation time. This key is not available on the Standard DataMaster.

The "P1" and "P2" keys are not active in most software but may have custom function in others. These keys are not available on the Standard DataMaster.

The "SET" and "ADV" (Set and Advance) keys are used to set the time and date and to select various options settings. See "Design and Use of the Set and Adv keys" for a detailed explanation of these keys.

The "F1" and "F2" keys are used to select and initiate various houskeeping and other specialized tasks for the DataMaster to do. See "Design and Use of the Function Keys" for a detailed explanation of these keys.

The "SUP" (Supervisor) key is used to initiate a supervisory test using a simulator. See section entitled "Simulators and Simulation" for a detailed explanation of this procedure. The number of tests that will be automatically sequenced, along with the target value of the solution being used in the calculations on the evidence ticket may be set in the options. (See use of the "Set" and "Adv" keys.)

The "NV" (No Volume) button is used to by-pass the normal requirements for a test. Pressing it when "Please Blow" appears on the display will cause the DataMaster to accept whatever reading is on the display at that time. This key may or may not be active in your software and it is important to note that any reading, except that of a non drinking subject, will be lower than the true BAC value of that subject if the results are accepted with the use of this key.

The "TST" (Test) button will cause the DataMaster to run a self diagnostic test and to print a result for you. Abnormal conditions that may be seen are printed on the evidence ticket. See "Status Messages" for an explanation of these conditions.

The "CPY" (copy) button will cause the DataMaster to print a copy of the last test run providing the power has not been turned off. If pressed immediately after startup and before any test has been run, it will print the title line and Serial number of your instrument.

The "MTR" (Monitor) button will allow you to view the detector voltage on the display. It will appear as "N.NNN" (N=Number). When the instrument is first turned on and no tests have been run (including a diagnostic test) the numbers will start at 1.999 falling rather quickly.

After a few minutes they will be at 0.000 +/- 0.500. The right most digit will drift several counts. After running a diagnostic, subject or supervisor test, these numbers will typically read 0.000, +/- 0.010.

The "CLR" (Clear) button is used to clear the options and title memory and reload new or current information. It is not normally functional and will have no noticable effect if pressed. It is used as follows: Turn DataMaster off. After several seconds, hold the clear button down and turn the DataMaster on. "CRC Error at 8000" will appear on the display. Press the clear button again and the display will return to normal. You will now need to reset the options using F1 and F2. If you do not, "OUT OF SERVICE" will appear if you try to run a test.

The "ABT" (Abort) button permits any test or function of the instrument to be interrupted by the operator and will cause the display to revert to a normal display mode. An audible "beep" will be heard as the button is pushed. This button may not be active at all times in all software.

DESIGN AND USE OF THE "SET" AND "ADV" (Advance) KEYS.

Your DataMaster is designed to be flexible! It is pre programmed to allow you to vary the selection of many operating functions without changing software. For example, you may, by using the "SET" and "ADV" (Advance) keys select to have one or more subject tests and to tell the instrument where in the testing sequence, if any, and how many simulator tests you wish to have along with the subject tests. These are only a few of the many options that are available to you. Additionally, the software is preprogrammed to allow you to quickly return to preselected option settings by using the "RESET OPTIONS" function available with the "F1" and "F2" keys explained in the section entitled "USE OF THE F1 and F2 KEYS". **Please note that all the options listed below may or may not be available in your software, and may vary somewhat from software to software, depending on the selections made by your supervising agency.**

Remember, "Set" selects the Option, 'Adv" changes it.

The use of these keys is very simple. To select a particular option, including changing of the time and date, press the "Set" key. The option selected then appears on the display. To change it, Press the "ADV" key once. Each time the "ADV" key is pressed, the next available selection for that option will be displayed. ie: If the option to change the minutes is displayed, pressing the "ADV" key once will advance the time by one minute. Holding down the "ADV" key will cause the minutes to keep advancing. When the option selection is complete press the "CLR" key to return to a normal display. The available selections are explained below. These options are normally password protected.

The changeable item of options is shown in Italics.

Display Shows:	Set and Advance Functions
MONTH DATE HR:MIN READY - PUSH RUN	From this normal display configuration, press "SET" once to begin the options displays.
MONDAY 13:30 READY - PUSH RUN	Day of week can be changed by pressing ADV
AUGUST 09 *08* READY - PUSH RUN	Month number (1-12 can be changed by pressing ADV
AUGUST 09 *09* READY - PUSH RUN	Day of Month (1-31) can now be changed by pressing ADV.
AUGUST 09 *1994* READY - PUSH RUN	Year (1900-99) can be changed by pressing ADV
AUGUST 09 *13:* READY - PUSH RUN	Hour of the day (:00-23:) can be changed by pressing ADV
AUGUST 09 *30:* READY - PUSH RUN	The minute of the Hour (:00 - :59) can be changed by pressing ADV
-OPTIONS- 2 or 3 DIGIT - *3*	The alcohol display value can be displayed in either 2 or 3 decimals during subject test.
-OPTIONS- ALCOHOL DISPLAY - *ON*	This option will turn the alcohol display off during a subject test
-OPTIONS- QUERY REFUSAL - *YES*	If you do not wish the refusal question to be asked, change this to "NO"
-OPTIONS- SUBJECT TESTS - *1*	Your choice is from one to five subject tests sequenced automatically.
-OPTIONS- SIM - *NONE*	Choose when during the subject test(s) you wish to automatically run a simulator. Any combination is Possible.
-OPTIONS- INTERFERENCE - *.010*	This feature varies by .001, from .00 to .010 equivalent BAC level at which interference will be detected.
-OPTIONS- SUPERVISOR TESTS-*LONG*	You may change the form of the supervisor test from long (normal) to short form (uses breath tube as input)
-OPTIONS- SUPERVISOR TESTS - *5*	This feature allows from 1 to 10 consecutive supervisor simulator tests to be run automatically
-OPTIONS- ETHANOL CONCNTRN-*.100*	This option varies the ethanol concentration to correct for actual simulator solution values during the calibration of the instrument.
-OPTIONS- KEYBOARD - *ON*	This option allows keyboard to be turned on or off as desired. If the keyboard is turned off, no questions will be asked.
-OPTIONS- DATA COLLECTION - *OFF*	This option advances data collection option to the ON position. Turn this option "on" only if your DataMaster is linked to a computer.
-OPTIONS- PRINTER - *ON*	This option allows the Printer to be turned on or off. If "off", the instrument will not print test results.
-OPTIONS- SIMULATOR AUTO/MANUAL	If "auto", the internal pump will run to drive the simulator during Supervisor tests. If "manual" the simulator will need an external air source.
-OPTIONS- SECURITY - *ON*	Allows the security feature to be turned off or on. If "off" passwords will not be required for operation.
-OPTIONS- SIMULATOR CHECK - *OFF*	This feature compares the simulator test results to the value contained in "Ethanol Concentration" above and aborts the test if not within a specified range. Should be off unless you are using a simulator with each subject test.
-OPTIONS- EXTERNAL PRINTER *Y/N*	When YES the DataMaster will look for an external printer, if not found

it will print to the internal printer

-OPTIONS-
ACETONE SUBTRACT *ON/OFF* — When "ON" will automatically subtract any detected interferent from the total reading.

-OPTIONS-
SIMULATOR COUNT *ON/OFF* — Counts the number of times the simulator is used.

-OPTIONS-
SIMULATOR TOLERANCE CHECK — This option permits the supervisor to set the parameters of tolerance for the simulator check in terms of BrAC

DESIGN AND USE OF THE F1 AND F2

Functions are different from options in that they are routines or "housekeeping chores" that you may ask the DataMaster to do. They are accessed by using the "F1" and "F2" keys at the top of the keyboard on the "K" model DataMaster and inside the locked supervisor panel on the Standard Instrument. These keys are password protected, always with a higher level password than that of an operator. The use of the Function keys is similar to the "Set" and "Adv" keys in that the "F1" key is used to select the function you wish to execute, and the "F2" key is used to initiate that function. The difference is that after the function is completed, the system will automatically advance to the next available function. If you do not wish to execute a function, simply continue pressing "F1" until the desired function appears on the display, or press the "CLR" key to return to a normal display. **Please note, your DataMaster may or may not contain all the functions listed here depending on the software chosen by your supervising agency.**

Below is a listing of the functions available in the DataMaster Software, along with an explanation of each.

RESET OPTIONS: This routine resets all of the options listed in the "Set and Adv" section above to the pre-programmed settings.

PRINT OPTIONS: This routine provides a printed record of the current options settings.

PRINT CAL FACTORS: This routine provides a printed record of the calibration factors as currently defined.

CLEAR DATA MEMORY: This routine will totally erase any test data stored in the DataMaster's memory.

CALIBRATE: This is not the same as "Simulate" or "Supervisor" function. This function will allow for recalibration of the DataMaster. Do not initiate this function by using the "F2" key unless you are in fact going to recalibrate the instrument. All old calibration factors are erased the instant this is initiated and the instrument will require recalibration before it can be used again. The display will ask "ARE YOU SURE", requiring another response before it will initiate this function.

LOG OFF: This feature is used to reset security to require a password. Most software will automatically log off after 5 minutes of inactivity and a password will again be required to access the various software features.

REMOVE FROM / RETURN TO SERVICE: This feature allows a supervisor to remove the Instrument from service without turning it off. When used, the Instrument will display the message "Out of Service" and will not run tests until the function "Return to Service" is executed.

PURGE GAS LINE (dry gas only): Purges air from dry gas line.

PURGE SAMPLE CHAMBER: This feature operates the pump continuously and is used to remove moisture from the sample cell in the event of a simulator accident. (See Tubing Diagram)

FACTORY CONFIGURATION: This routine allows a service technician to change software in the DataMaster while still retaining the original Calibration Factors.

SET OPERATOR PASSWORD This option allows the supervisor to change the current password required at the operator security level.

DATAMASTER STATUS CODES

Status codes are operator alerts that may or may not require corrective action. Each is explained below along with appropriate possible causes and corrective actions, if any. If necessary, seek advise from DataMaster service personnel by calling 1-800-800-8143. They will advise a course of action. Note: this is a complete listing of Status Codes, not all of which are applicable to all models of the BAC DataMaster.

AMBIENT FAIL The DataMaster has the ability to measure the ambient air being drawn into the instrument during the purge cycle. If this air is contaminated with alcohol or another detectable substance, an "AMBIENT FAIL" error is generated. Common causes of this include a contaminated mouthpiece left in the breath tube during the purge cycle, the breath tube inlet in near proximity to a subject heavily contaminated with alcohol, or the recent use of certain cleaning compounds in the room housing the instrument. The test may be restarted after removing the mouthpiece, moving the subject away from the instrument, and ventilating the room if necessary.

BLANK ERROR Prior to each test, and optionally following the last test, the DataMaster performs a blank test to verify a near zero reading. If this reading is .004 or above, a "BLANK ERROR" is reported. This error may be caused by any of those listed for "AMBIENT FAIL' or "SYSTEM WON'T ZERO above and should be treated appropriately.

CALIBRATION ERROR At the time of calibration, value of the quartz standard as seen by the correctly calibrated DataMaster is stored in memory. This value is checked prior to each test sequence and any change is compensated for in the subsequent readings. If it is found to not be within 10% of the original value when checked prior to a test, the above error will appear.

DATA MEMORY BATTERY LOW RAM backup battery voltage is low or non existent. The instrument may not retain the options settings or stored data when turned off if this condition is not corrected. This condition will not affect the validity of a subject test but will require resetting the time and date each time the instrument is turned off.

DETECTOR OVERFLOW The Detector output exceeds that readable by the instrument A/D converter. This error will usually happen

only during either a subject or simulator test, and the causes can be the same as those for a "System Won't Zero." Simulator solution in the sample chamber is also a likely cause for this message.

DETECTOR TOO HIGH This message will only be seen on a diagnostic test and the causes are again similar to those for a "System Won't Zero". The voltage output of the detector is not showing enough signal to be usable. High positive numbers on the display will typically be seen using the "MTR" button.

DETECTOR TOO LOW This message will only be seen on a diagnostic test. The voltage output of the detector is so high that it is not usable. Low negative numbers will usually be seen on the display using the "MTR" button. Except under very unusual conditions, this message will require maintenance assistance. The only possible remedy will be to turn the instrument off and then on again to allow the detector electronics to reset.

DIAGNOSTIC RECORD (AR) Used in Arkansas Software and provides a record of Diagnostic Tests.

FATAL SYSTEM ERROR At (XXXX) Some portion of the software or memory is not responding correctly to the computer. This may be a temporary condition that can be corrected by turning the instrument off and holding the "CLR" button down while turning it on. The Message "CRC ERROR at 8000" should appear on the display as the instrument reloads the correct memory configuration. Press the "CLR" button again and the instrument should return to a normal display. If the same "FATAl" error reappears, call for service assistance. It is also possible, depending on which area of the memory was involved, that the instrument may lose calibration factors. If this is so, the message "NOT CALIBRATED" will appear if you should try to run a test. If this message does not appear, there is no need to reestablish the calibration.

FILTERS ERROR The instrument is unable to detect a difference in voltages at the time the optical filters are switched into the light path. This can be caused by a number of problems, none of which are user servicable. If this condition persists, call for service.

FLOW DETECTOR ERROR The diagnostic test has determined that the flow thermistor is unable to detect air flow. This condition can be seen if a diagnostic test is attempted in a fairly cool environment after the instrument is just turned on and before it has had sufficient time to warm. A thermistor is heat sensitive and the proper setting is made while the instrument is fully warmed and stabilized. If the ambient temperature is determined not to be the problem, look for a loose cable connector (J10 on sample control PCB). If a cause cannot be determined, call for service. Note: If, during a diagnostic test, the flow detector is determined to be inoperative, the pump will not activate. This does not indicate that there is a problem with the pump since the computer will not attempt to run the pump if there is no means to sense if it is running.

INTERFERENCE DETECTED The DataMaster is specific for Ethanol and has determined by comparison of either 2 or 3 different optical filters that there is some substance other than ethanol present in the sample. The subject should be observed for any signs of behavior or physical condition not entirely consistent with those of ethanol intoxication.

INVALID SAMPLE This message is seen only during a subject or simulator test if conducted during the subject test mode. The instrument has detected a negative going value during the test and the assumption is that there is mouth alcohol present. This can be caused by a subject blowing too hard as saliva droplets can be forced through the mouthpiece and into the sample chamber causing a somewhat unstable reading, and is more commonly seen when the subject has a very high alcohol level. It is very rarely caused by a maintenance difficulty such as dirt in the sample chamber. See section entitled "DataMaster Sampling System". Usually a retest of the subject after a short waiting period (5 to 10 Min) will result in a valid test.

NOT CALIBRATED The calibration factors used by the instrument either have not been established or have been lost due to a memory failure. If this message appears after a "Fatal System Error" it will be necessary to first determine the cause of the "Fatal" (or to determine that it does not happen again on power up) then to recalibrate the DataMaster. This condition will also occur if the "F2" button is pushed while the function message "CALIBRATE" appears on the display. The old calibration factors are immediately lost if this sequence is activated although you will have a second opportunity to abort the procedure when asked "Press F2 AGAIN IF YOU ARE SURE".

NOT SET UP The stored options settings either have not been established or have been lost due to a memory problem. This will typically be seen after clearing the memory by turning the instrument on while holding down the "CLR" key. If the message "Data Memory Battery Low" is not seen in conjunction with "Not Set Up", this condition can be corrected by "RESET OPTIONS" using the "F1" and "F2" buttons.

OUT OF SERVICE This message will be seen after the instrument has been taken out of service by using the "REMOVE FROM SERVICE" feature of the Functions, or, in some software, after a memory failure that has resulted in a loss of calibration factors. Return the instrument to service using the "RETURN TO SERVICE" feature of the Functions (F1 and F2). If the calibration factors have been lost, you will receive a message indicating so when a test is attempted, or you may use the Functions feature to "Print Calibration Factors". If calibration is lost, it will be obvious by the appearance of non numerical values on the printed ticket.

PRINTER ERROR The printer is unable to respond to the computer. This can be as simple as a ticket stuck in the printer or a loose or disconnected cable. It is also possible that the printer head for some reason may have stuck in mid travel. Please see section entitled "Basic Maintenance Procedures."

PUMP ERROR Flow detector does not detect pump operation. The flow thermistor lies in the breath path ahead of the pump which enables it to check at all times to be certain there is air flow. Any problem that stops the air flow while the pump should be working will create this condition. Look for an obstruction that prevents the air from coming into the breath tube, loose or disconnected tubing inside the DataMaster, or possibly an inoperative or unplugged pump.

RADIO INTERFERENCE The RF Detection circuit has been activated. The instrument only "looks" for RF when the detector output is being monitored by the A to D converter. Since this system is very sensitive, it is possible that the circuit can be activated by a hand touching the antenna. Be careful when the mouthpiece is being removed not to touch the antenna. Whether or not the test results will be printed may be software dependent, but generally if the RF was not activated until after the completion of the subject blow, a valid test result will be returned and "Radio Interference" will be printed on the ticket after the subject test.

RAM ERROR at (XXXX) Random Access Memory bite check does not match the calculated value. See procedures for "Fatal System Error" above.

SIMULATOR OUT OF RANGE This message can only appear during the following conditions: (1) There is a simulator test being run either in supervisory mode or with a subject test, and (2) "Simulator Check" in the options is turned "On". The expected simulator value as defined by the user in the options or as set in software, is outside of the acceptable range as set in software.

SIMULATOR TEMPERATURE (Only available when the DataMaster is designed to monitor the temperature of the simulator.) The Simulator temperature outside acceptable limits as set in software.

SOLUTION CHANGE RECORD (SC) Used in South Carolina Software and provides a record of the simulator solution changes.

SYSTEM WON'T ZERO Prior to each reading, the DataMaster determines it's zero reference point. Should it be unable to do this, a "SYSTEM WON'T ZERO" error occures. This error is indicative of the subject providing a sample at an inappropriate time, i.e. immediately preceeding or during the ambient zeroing process. In older DataMasters, lacking the "AMBIENT FAIL" detection, it is also possible for this message to be attributed to one of the casues mentioned above. A third possible cause, particularily if this error is chronic, is an instability in the infrared detector processing electronics.

TEMPERATURE HIGH The sample cell temperature has risen to 55°C or above. This is typically a maintenance problem although it is possible that unusually warm room conditions can also be a cause. Turn the instrument off and allow it to cool for 15 minutes. If the same problem is seen again on power up, call for service assistance.

TEMPERATURE LOW The sample cell temperature fails to reach 47°C or falls below 45°C. Normally this can happen if the instrument is in a fairly cold environment and has just been powered up. If the proper temperature is not reached within the established time limit, this message will be seen. Turn the instrument off and on again to give it additional time to warm up. If the same problem reappears, call for service assistance.

Some Conditions That are User Servicable.

DISPLAY BLACK BAR This is a condition, not a message, where the display shows a solid black bar across usually the top portion, although it is possible to have both the upper and lower segments of the display "black barred". No buttons will respond to the touch during this condition. This is a fairly rare condition in the field indicative that program control has been lost and usually only happens after a severe electrical disturbance of some nature. Turning the DataMaster off and then on again will often cure this sympton with no other effects.

LOCKED OR FROZEN DISPLAY. This is a condition, not a message. See above "Display Black Bar".

DATA ENTRY KEYS WILL NOT RESPOND This is a condition, not a message. Usually the special operations keys will respond. Particularily if the cover has just been removed and replaced again, check the cable from J1 on the CPU board to the keyboard driver assembly in the cover .

COLD BREATH TUBE The breath tube must be warm to prevent condensate. It is heated with an internal heater wire powered by 18 VDC from the receptical immediately below the breath tube itself. If the breath tube is cold during a subject test, the test results will be low and purging the instrument after a test will become more difficult. This item is user replaceable with part no 41211.

Using a Simulator Correctly

The most critical link in the simulation process is the simulator, which is designed to operate with 500 ml of solution at an operating temperature of 34 degrees centigrade, +/-.2 degree centigrade. Most styles of simulators use a standard mercury thermostat. Some of the more common problems encountered with simulators are:

MERCURY SEPARATION in the thermometer (usually yellow in color). Although this problem does not affect the operation of the simulator, it does mean that you will not be able to verify the correctness of the temperature.

MERCURY SEPARATION in the thermostat (usually white in color). Depending on exactly where it is separated, this can cause the simulator to run either too hot or too cold. Sometimes this can be corrected by putting the simulator in the freezer for a few hours (sans solution, of course). This problem must be corrected or the simulator will not maintain the correct temperature.

LEAKS around gaskets and seals make for low readings. A quick check procedure is to seal the OUTPUT PORT (front) closed with a finger and blow into the INPUT PORT (top). Bubbles should be minimal and there should be a good deal of back pressure.

LENGTHY TUBING from the simulator output port to the Vapor input of your instrument will cause condensation and lowering of readings during the first several tests. The condensate is eventually equillibrated and the effect is then minimal.

LOOSE CONNECTIONS anywhere along the vapor path will cause leaks and lower the reading. A reading that rises slowly is a good indication of a leak.

USE CAUTION that the simulator is always UNPLUGGED prior to immersion into solution, and never remove it from the solution without first unplugging or turning it off.

CLEANLINESS: Clean and dry all parts of the simulator carefully so that no algae or bacterial growth occurs on the operating parts. Failure to dry the inside of the simulator, and the resultant moisture that remains also becomes a problem in that all the ethanol in the remaining water will have vaporized by the next time you simulate, leaving only pure water to dilute your solution.

USE A MOUTHPIECE between the simulator output and the breath tube of your instrument (if you are not using the simulator ports) to prevent solution droplets from passing into the instrument.

SIMULATOR TESTS ON THE DATAMASTER

The use of a water and ethanol solution of specified proportions and at an exact operating temperature is used, and in most state, required by state rules, as means of certifying the correct operation of a breath test instrument. Your DataMaster allows for two modes of simulation, Automatic (figure 1) and Manual (figure 2). In both methods it is imperative that the tubing be correctly connected to the DataMaster. *If the tubing is reversed, the solution will be introduced into the sample chamber and can result in permanent damage to the instrument requiring major repairs.* In the event this happens, it is imperative that the problem be corrected immediately. Allowing the solution to remain in the sample cell for longer than several hours will cause damage. *See the "Emergency" note on the Page entitled "Tubing Diagram" for instructions.*

Automatic Simulation

1. Fill the simulator with 500Ml of solution, replace the top and check the seal by holding a finger over the output port (front) and blowing into the input port (Top). There should be minimal bubbles.

2. Turn on the simulator and allow it to warm up fully. The metal surrounding the top of the glass jar should be warm before attempting a simulation. A cold top will result in a low reading because the vapor will condense on the cold surface.

3. Before connecting the simulator to the DataMaster, blow thru the input port to thoroughly mix the vapor in the space above the solution.

4. Connect the "Pressure Out" port of the Data-Master to the input of the simulator ("A" in figure 1, above). Connect the "Vapor In" port of the DataMaster to the output of the simulator ("B" in figure 1, above). ***Keep all tubing lengths as short as possible.***

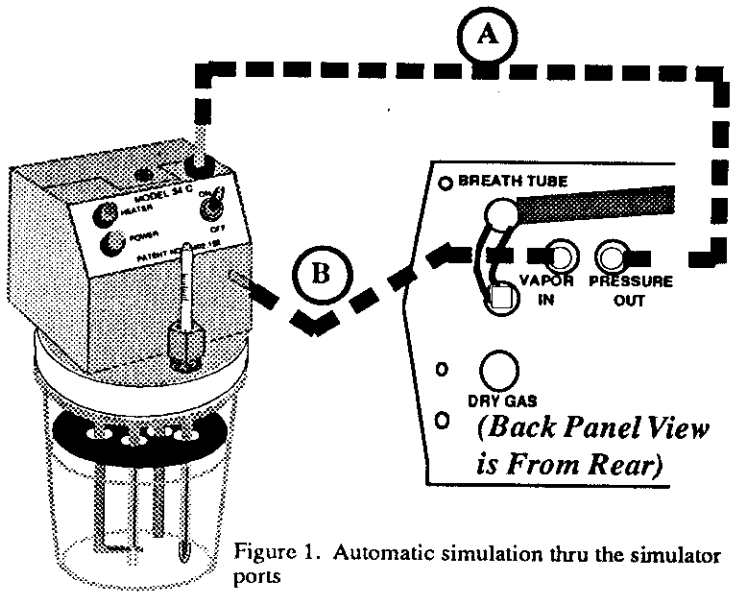


Figure 1. Automatic simulation thru the simulator ports

5. Press the key labled "SUP" to begin the simulator test and follow the prompts on the display or your checklist if one is provided. The DataMaster will automatically run the simulator test(s) according to the programmed directions.

Note: In the options, "Automatic" form of simulation may be called "Long" form in some software. The two are identical. To vary the number of simulator tests see the "Options" section.

Manual Simulation

1. Follow steps 1 thru 3 above.

2. Connect a mouthpiece to the input of the simulator using a short length of 1/4 in. plastic tubing ("A" in figure 2).

3. Press the key labled "SUP" to begin the simulator test and follow the prompts on the display or your checklist if one is provided. The DataMaster will begin the simulator test(s) according to the programmed directions.

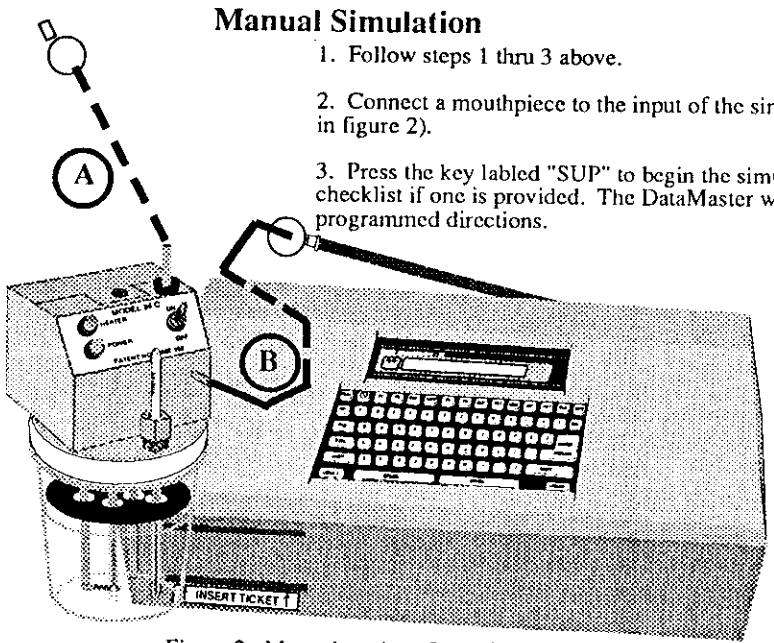
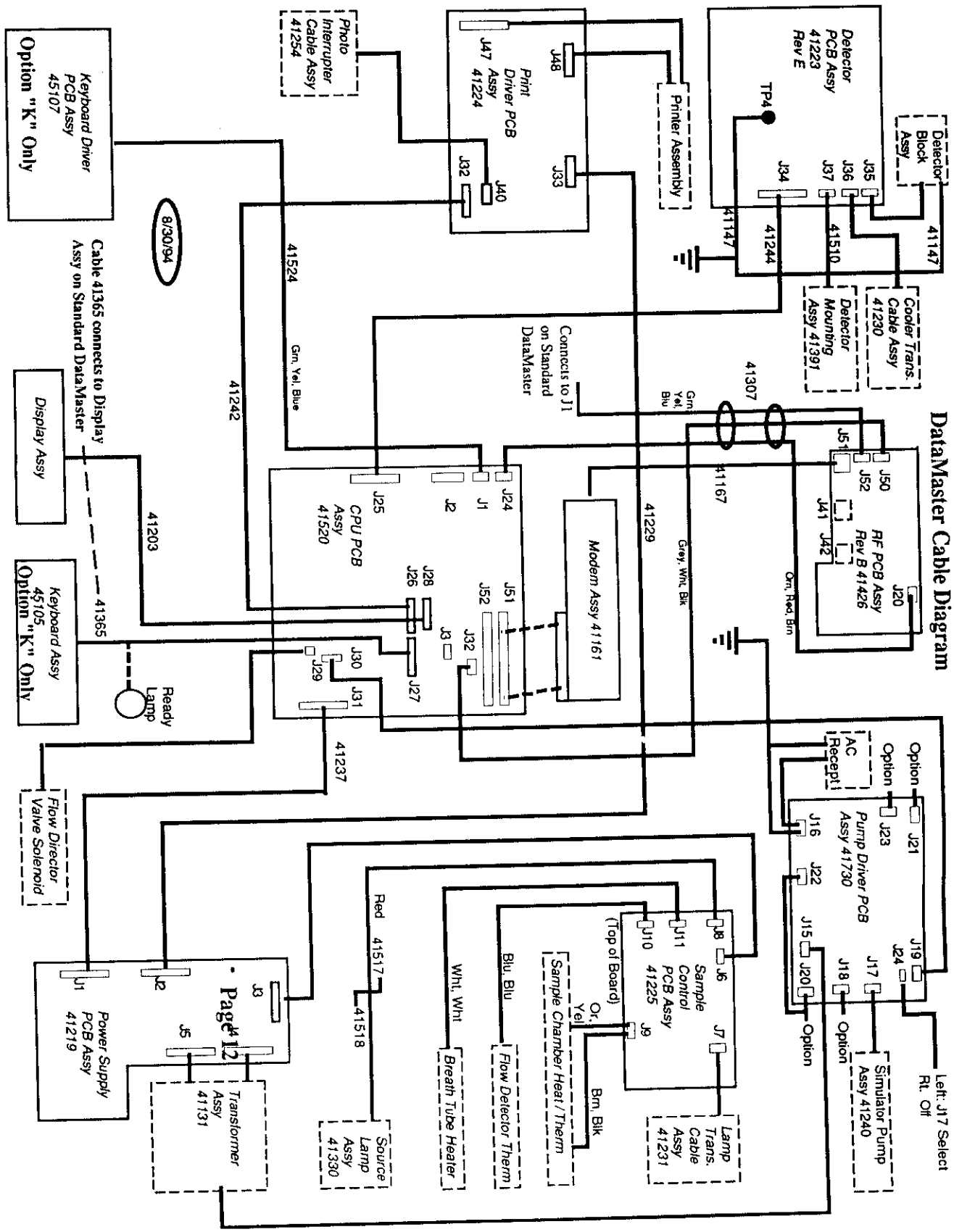


Figure 2. Manual or short form simulation thru the breath tube

4. When the display prompt reads "EXTERNAL STANDARD" connect the output of the simulator to the breath tube of the DataMaster, using a mouthpiece as shown ("B" in figure 2). ***Keep all tubing lengths as short as possible.***

5. Blow thru the simulator input ("A" in figure 2) with a moderate breath for about 5 seconds, then taper the breath pressure to a stop. ***Do Not blow hard into the simulator, as the test will be more difficult to complete.***

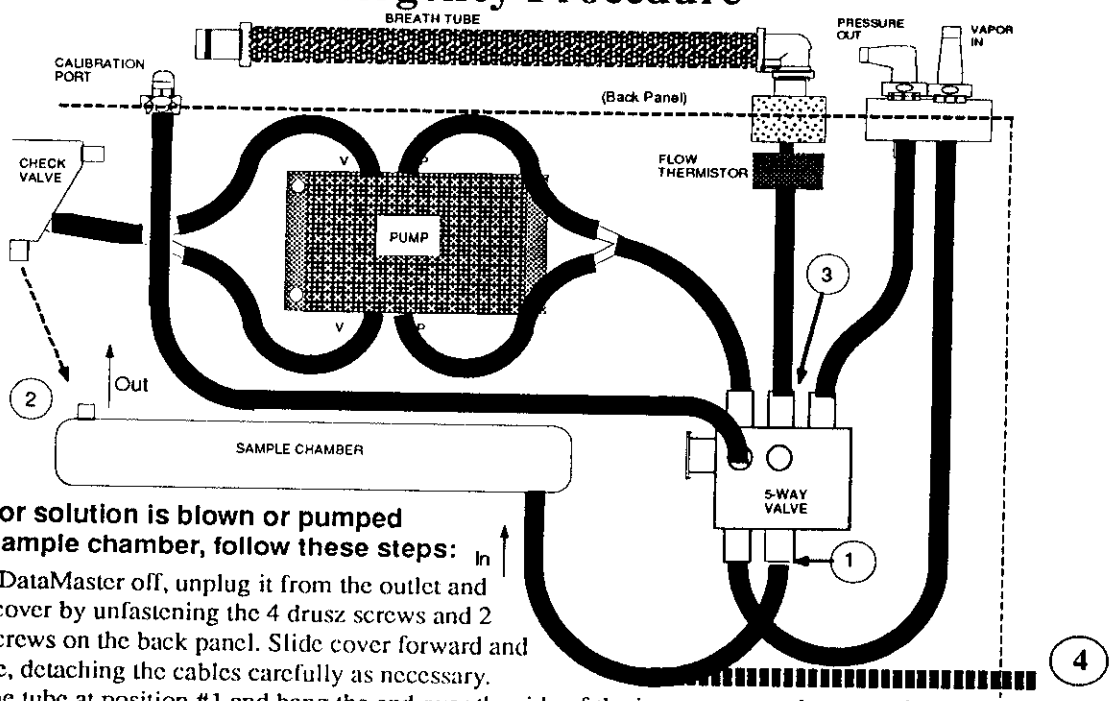
Note: In some software "Manual" may be called "Short" form of calibration. If it is call "Short" there will be no automatic purge at the end of the test.


DataMaster Cable Diagram
Detector Block Assy
41147
Detector PCB Assy 41223 Rev E
TP4
J35
J36
J37
J34
41147
41244
41510
Cooler Trans. Cable Assy 41230
Detector Mounting Assy 41391
Printer Assembly
Photo Interrupter Cable Assy 41254
Print Driver PCB Assy 41224
J47
J48
J33
J32
J40
Keyboard Driver PCB Assy 45107
Option "K" Only
8/30/94
Cable 41365 connects to Display Assy on Standard DataMaster
41524
Grn, Yel, Blue
41242
Connects to J1 on Standard DataMaster
Grn Yel Blu
41307
41167
41229
Gray, Wht, Blk
Org, Red, Brn
J50
J52
J51
J41
J42
RF PCB Assy Rev B 41426
J20
Display Assy
41203
CPU PCB Assy 41520
J25
J2
J1
J24
J28
J26
J51
J52
J3
J32
J27
J30
J29
J31
Modem Assy 41161
Keyboard Assy 45105 Option "K" Only
41365
Ready Lamp
41237
Flow Director Valve Solenoid
Option
AC Recept
Option
J23
Pump Driver PCB Assy 41730
J21
J16
J22
J15
J20
J19
J24
J17
J18
Option
Option
Simulator Pump Assy 41240
Left: J17 Select Rt. Off
J8
J6
J11
J10
Sample Control PCB Assy 41225
(Top of Board)
J9
J7
Or, Yel
Sample Chamber Heat / Therm
Brn, Blk
Lamp Trans. Cable Assy 41231
Blu, Blu
Flow Detector Therm
Wht, Wht
Breath Tube Heater
Red
41517
41518
Source Lamp Assy 41330
J1
J2
J3
J5
Power Supply PCB Assy 41219
Transformer Assy 41131

DataMaster Maintenance and Emergency Procedures

Note: It is advisable to turn your DataMaster off and unplug it during severe electrical disturbances, including storms and testing of your emergency generator. Low voltages can do damage.

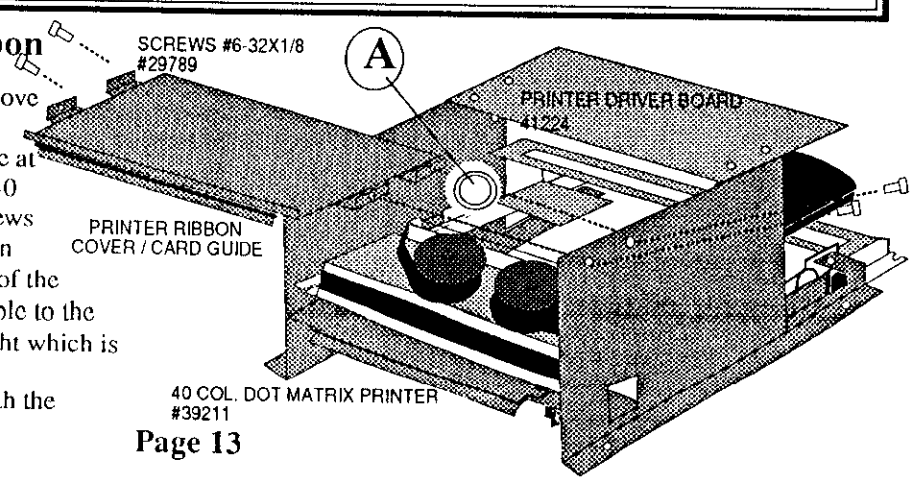
Tubing Diagram and Flooded Sample Chamber Emergency Procedure



If simulator solution is blown or pumped into the sample chamber, follow these steps:

1. Turn the DataMaster off, unplug it from the outlet and remove the cover by unfastening the 4 drusz screws and 2 grounding screws on the back panel. Slide cover forward and up to remove, detaching the cables carefully as necessary.
2. Detach the tube at position #1 and hang the end over the side of the instrument as shown so that the solution does not drain onto the instrument base. See position #4.
3. Detach the check valve from position #2 and reattach a piece of 1/4 in. tubing 5 or 6 in long in its place.
4. Blow into the tube at position #2. The excess solution will exit the cell through the tube at position #1.
5. Detach the tube at postion #3 and remove any solution with a towel.
6. After being certain no solution is on any of the circuit boards, reattach all tubing, the check valve and replace the cover and power cord. Turn the DataMaster on. Be sure a normal "Please Wait" appears on the display. If not, turn the Instrument off and call service.
7. Using the F1 key, go to "Purge Sample Chamber." Use F2 to begin the purge. Allow the DataMaster to continue to purge until the reading on the display stabilizes at .000 +/- .500. this may take up to an hour. After the reading has stabilized, check the DataMaster with a simulator test. If the results are in tolerance, return the instrument to normal service. *There may be permanent damage if the solution is allowed to remain in the cell for more than 8 hours.*

Changing the Printer Ribbon



1. Follow instruction #1 above and remove the top cover.
2. Detach the printer driver ribbon cable at J32 and the Photo interrupter cable at J40 (See cable diagram). Remove the 4 screws holding the "printer Cover/Card Guide in place and lay this assembly to the front of the printer being careful not to stress the cable to the Photo Interrupter switch at the lower right which is secured to the card guide by a cable tie.
3. Remove the old ribbon noting the path the